application bulletin

FLUKE

ab-21

Systems Use of the 6010A Synthesized Signal Generator

INTRODUCTION

The 6010A Synthesized Signal Generator can be programmed using either of two formats (or instruction sets) and either of three interfaces: standard, IEEE 488 or RS-232C. The standard 6010A is equipped with a Fluke defined interface consisting of a two wire handshake with seven ASCII defined data lines. Data is transferred into the 6010A in seven bit bytes, i.e., character serial.

Option 05 is the IEEE standard digital interface for instrumentation. This interface is defined in IEEE STD 488-1975.

Option 06 is the RS-232C bit serial interface and is defined in EIA publication RS-232C.

These interfaces are mutually exclusive, that is, only one may be installed in a given instrument.

Field installation of options –05 and –06 is possible. Order 610/11-05K or 610/11-06K.

PROGRAMMING FORMATS

The 6010A may be programmed using either of two instruction sets: "fixed" format or "free" format. Fixed format is faster and less flexible than free format. Free format allows digital programming of all front panel functions except output level. Fixed format allows programming of frequency, range, modulation, and fixed attenuator.

Fixed Format

Fixed format must be selected over free format as follows:

1) Standard Interface - Pin 19 on Remote Control connector (rear panel, J4) must be left open or in a TTL high condition (> 2.4 VDC).

2) IEEE-STD-488-1975 Interface (option 05) - Switch S1 on the interface card (6010A-4008) must be set to Fixed Format position. This card is located behind the front panel PCB and is accessible by removing the top cover of the instrument.

3) RS-232C Interface (option 06) - This interface has an associated external cable assembly (6010A-4456) which has a 25 pin RS-232C connector (J2) on one end and a 24 pin connector (J1) the other. J1 mates with the Remote Control connector (J4) on the rear panel of the synthesizer. In order to select fixed format, cut the jumper wire between pin 19 and pin 11 on J1.

Frequency Programming

Each decade of frequency is individually addressed in fixed format. Refer to Table 1. There are two sets of address locations: an input holding register addressed by ASCII characters A through G; and an output control register addressed by characters Q through W.

Data may be loaded into the input holding register in advance of when that frequency is actually needed at the output of the generator. Data will transfer to (or update) the output control register with transmission of either of three character sequences:

1) when a comma is sent

2) when an appropriate numeric is sent following the letters H or I. Refer to Table 1.

When it is desired to change the frequency in a particular decade directly (immediate update), that decade may be addressed in the output control register using characters Q through W.

Data in either register will remain there until written over or the synthesizer power is shut off. It is, therefore, not necessary to reenter data in decade that remain unchanged. Example: present frequency 10.7 MHz; send Q Ø; frequency now 0.7 MHz.

Example:

The generator is already operating at a frequency of 10 MHz, and it is desired to change to a frequency of 9.87654 MHz. Below is a sequence of the two types of frequency commands versus actual output frequency.

INPUT HOLDING REGISTER METHOD (Delayed Update)		OUTPUT CONTROL REGISTER METHOD (Immediate Update)	
Character Sequence	Actual Output Freq.	Character Sequence	Actual Output Freq.
A	10.00000MHz	Q	10.00000MHz
Ø	"	Ø	00.00000MHz
B	"	R	00.00000MHz
9	"	9	9.00000MHz
C	"	S	9.00000MHz
8	"	8	9.80000MHz
D	"	T	9.80000MHz
7	"	7	9.87000MHz
E	"	U	9.87000MHz
6	"	6	9.87600MHz
F	"	V	9.87600MHz
5	"	5	9.87650MHz
G	"	W	9.87650MHz
4	"	4	9.87654MHz
,(comma)	9.87654MHz		

Frequency Range

There are two frequency/resolution ranges (bands) that may be selected by the appropriate numeric following the letter H. Refer to Table 1. When ASCII data bit 2 is not true, the generator is in low range (10 Hz - 109.9999 kHz in 0.1 Hz steps). When ASCII data bit 2 is true, the generator is placed in high range (10 Hz to 10.99999 MHz in 10 Hz steps).

Modulation

AM and FM conditions may be selected by sending the appropriate numeric following the letter H. Refer to Table 1.

If ASCII data bit 4 is true, FM is on, and if it is not true FM is off. If ASCII data bit 3 is true, AM is on and if it is not true, AM is off.

Type of Level Control

Control of output level over a 26 dB range (20:1) while under remote program control may be done by either of two means: by front panel level control knob or by remote DC analog voltage applied at the AM IN connector on the rear panel. The appropriate numeric preceded by the character H will select the desired type of control. Remote DC control will be selected if ASCII Data Bit 1 is true, and front panel control will be selected if it is not true.

Table 1. 6010A FIXED FORM CHARACTER DEFINITIONS

Addressed Position	Octal Equiv.	ASCII Address Char.	Typical Processing Time (mS)	Following Numeric (ASCII Char.)	Typical Processing Time for Numerics (mS)	Octal to ASCII Relationship for Numerics
Frequency Delayed Update						
High Band / Low Band						
10 MHz / 100 kHz	101	A	0.7	0 or 1	0.7	060 0
1 MHz / 10 kHz	102	B	"	0 thru 9	"	061 1
100 kHz / 1 kHz	103	C	"	"	"	062 2
10 kHz / 100 Hz	104	D	"	"	"	063 3
1 kHz / 10 Hz	105	E	"	"	"	064 4
100 Hz / 1 Hz	106	F	"	"	"	065 5
10 Hz / 0.1 Hz	107	G	"	"	"	066 6
						067 7
Immediate Update						070 8
						071 9
High Band / Low Band						072 :
						073 ;
10 MHz / 100 kHz	121	Q	0.8	0 or 1	1.8	074 <
1 MHz / 10 kHz	122	R	"	0 thru 9	"	076 >
100 kHz / 1 kHz	123	S	"	"	"	077 ?
10 kHz / 100 Hz	124	T	"	"	"	015 CR
1 kHz / 10 Hz	125	U	"	"	"	012 LF
100 Hz / 1 Hz	126	V	"	"	"	
10 Hz / 0.1 Hz	127	W	"	"	"	

FM, AM Range, and Level Control

(Updates frequency when numeric is sent)

110	H	0.7

ASCII Char.	FM	AM	Freq. Range	Level Control	Typical Processing Time for Numerics (mS)
0	Off	Off	Low	Front Panel	3.0
1			Low	Remote DC	"
2			High	Front Panel	"
3		Off	High	Remote DC	"
4		On	Low	Front Panel	"
6	Off	On	High	Front Panel	"
8	On	Off	Low	Front Panel	"
9			Low	Remote DC	"
:			High	Front Panel	"
;		Off	High	Remote DC	"
<		On	Low	Front Panel	"
>	On	On	High	Front Panel	"

Step Attenuator

(20 dB steps) 111 | 1 | 0.7

ASCII Char.	Attenuation	Typical Processing Time for Numerics (mS)
0	0 dB	2.1
1	20 dB	"
2	40 dB	"
3	60 dB	"

Frequency Update 054 | (comma) | 1.6 | None

AM versus Remote DC Control of Level

When either AM or Remote DC level control have been enabled, the AM annunciator lamp on the front panel will light. Both the modulating signal for AM and the remote DC control voltage must be applied at the AM IN connector on the rear panel. It is, therefore, not possible to have AM and remote DC level control enabled simultaneously.

Instantaneous Modulating Voltage During AM	Resulting Output Voltage rms, terminated. (2.5V rms nominal)	Remote DC Control Voltage	Resulting Output rms Voltage terminated.
> +4.5	not defined	> 5	not defined
+4.5	4.75	+5	5
+3	4.0	+4.5	4.5
+2	3.5	+3	3
+1	3.0	+2	2
+0.25	2.625	+1	1
0	2.5	+0.25	0.25
−0.25	2.375	< 0.25	not defined
−1	2.0		
−2	1.5		
−3	1.0		
−4.5	0.25		
< −4.5	not defined		

As can be seen from the table above there is a different gain factor for AM and Remote DC level control.

Input impedance is 600 ohms for both AM and Remote DC level control.

Step Attenuator

Output level can be commanded to change in 20 dB (x 0.1) steps. Refer to Table 1. The appropriate numeric following the letter I will result in attenuation of 0 dB (x 1), 20 dB (x 0.1), 40 dB (x 0.01), or 60 dB (x 0.001).

Free Format

Free format programming mode must be selected over fixed format by the following means:

1) Standard Interface - Pin 19 on the remote control connector (J4 on rear panel) must be grounded or held below 0.8 VDC by a TTL gate.

2) IEEE-STD-488-1975 interface (option 05) - Switch S1 on the interface card (6010A-4008) located behind the front panel must be set to the FREE position. Top cover of instrument must be removed for access.

3) RS-232C Interface (option 06) - Pin 19 on J2 (24 pin connector) of adapter cable assembly 6010A-4456, must be connected to pin 11. This cable is manufactured with these pins connected, and this can be verified by checking continuity with an ohmmeter.

Frequency Programming

Frequency data is entered by sending a string of numerics followed by an H, K, or M (signifies Hz, kHz, MHz). See Table 2.

Example:

All of the following result in an output frequency of 1MHz:

1 M	01M
1000 K	1.0M
1000 000 H	01000.00K

Leading and trailing zeroes, blanks, spaces, carriage returns, line feeds, and rubouts are ignored.

Frequency Range

If the commanded frequency is less than 110 kHz, the low range will be selected automatically. By sending the letter U, this selection may be overridden to place the unit in high band. U may be sent in advance of, or subsequent to, the H, K, or M frequency character. Override of low range must be done when the frequency is being edited (swept using letter I) across the 110 kHz range boundary.

Likewise, the letter L will change the range from high to low, but only when the output frequency is below 110 kHz.

Table 2. 6010A FREE FORM CHARACTER DEFINITIONS (Continued)

Addressed Position	Octal Equiv.	ASCII Char.	Typical Processing Time (mS)	Associated Numeric (ASCII Char.)	Typical Processing Time for Numerics (mS)	ASCII to Octal Relationship for Numerics
AM: Amplitude Modulation	101	A(n)	0.85	n: 0 = AM off; 1 = AM on	0.65	
FM: Frequency Modulation	106	F(n)	0.9	0 = FM off; 1 = FM on	1.4	
Level Control: Remote DC	105	E(n)	0.9	0 = Front Panel; 1 = Remote DC	1.7	0 060 1 061
Select Edit Decade: selects decade to be edited. Indicated by bright digit.	102	B(n)	0.9	n: 0 = 0.1 Hz; 1 = 1 Hz; 2 = 10 Hz; 3 = 100 Hz; 4 = 1 kHz; 5 = 10 kHz; 6 = 100 kHz; 7 = 1 MHz	1.2	2 062 3 063 4 064 5 065 6 066 7 067 8 070 9 071
Increment: Increments edit decade by 1	110	I	7.8 to 9	None		(Dec. Pt.) 056
Decrement: Decrements edit decade by 1	104	D		None		CR 015 LF 012
Step Attenuator:	117	O(n)	0.9	n: 0 = 0 dB X1; 1 = 20 dB X0.1; 2 = 40 dB X0.01; 3 = 60 dB X0.001		? 077
Frequency:	115	(n)M	7	0 to 9	1.2 per Char.	
	113	(n)K	7	and		
	110	(n)H	7	Decimal Point	0.8	
Low Range: overrides unit to low band: 10 Hz - 110 kHz	114	L	1.5	None	—	
High Range: overrides unit to high band: 10 Hz - 11 MHz	125	U	1.5	None	—	
Store: Stores frequency, band, edit decade, fixed attenuator setting, AM, and FM conditions in any of 10 locations.	123	S(n)	0.9	0 through 9	5.1	
Recall: Recall data from any of 10 storage locations.	122	R(n)	0.9	0 through 9	10	
Clear: Clears all functions and display	103	C	2.5	None	—	

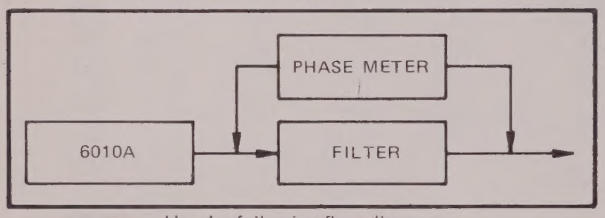
Frequency Editing

It is possible to remotely increment or decrement the frequency command to the generator in the same manner as with the front panel edit controls. The decade to be edited is designated by the letter B followed by a number from 0 through 7 (0= 0.1 Hz, 1= 1 Hz, 2 = 10 Hz, . . . 7 = 1 MHz). Every time an I or D is sent, that decade increments or decrements by 1. It is, therefore, possible to sweep the frequency of the 6010A by sending a string of Is or Ds.

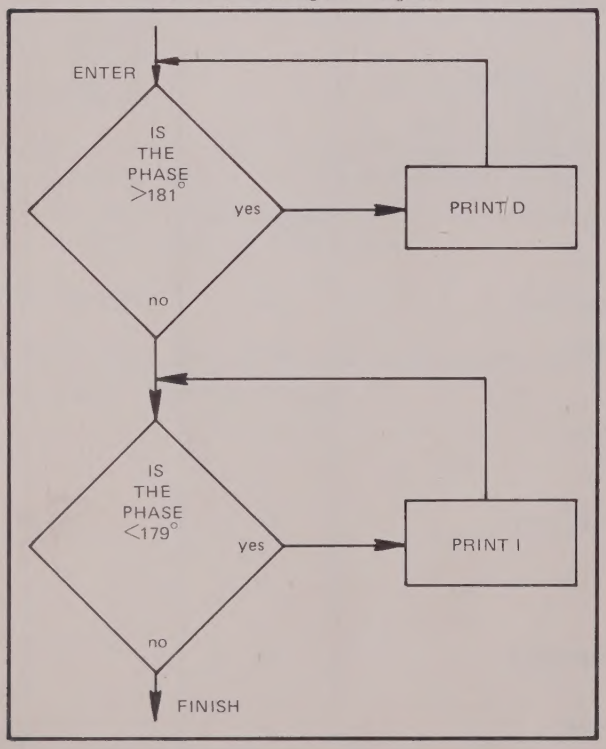
Application Suggestion

Frequency Edit function: The "I" and "D" characters may be used in an iterative process to bring the frequency of the synthesizer to a desired value.

Example: It is desired to set the frequency of the generator such that the phase shift through a filter is 180 degrees ±1 degree.



Use the following flow diagram:



Clear

The letter C will clear all functions and the display. Unlike front panel operation, clear is not required before entering a new frequency.

Storage and Recall from Memory

There are 10 memory locations in the 6010A. Each memory location will store the following parameters simultaneously: frequency, modulation, fixed attenuator setting, edit decade, and high/low band. To store a group of parameters send S, followed by the location 0 through 9. To recall from memory, send R and the desired location 0 through 9. Unlike front panel operation, an R must be sent prior to every location number.

Data may be stored in memory manually and recalled under remote control, and vice versa. The memory registers must be written over to erase, or the power turned off.

Modulation

AM and FM may be enabled or disabled remotely. The letter A followed by 1 will turn AM on; AØ will turn AM off. The letter F followed by 1 will turn FM on, if option 03 is installed. FØ will turn FM off.

Output Amplitude Control

Output level is controlled by a step attenuator and by either a remote DC voltage or the front panel level potentiometer. The 20 dB (x 0.1) step attenuator is addressed by the letter O and a following numeric. Refer to Table 2. Control of level between 20 dB steps may continue to be exercised, while in remote, by the front panel level control. If remote DC control is desired, the letter E followed by a 1 will disable the front panel level control. EØ will restore front panel level control.

It is not possible to have remote level control and AM enabled simultaneously. Refer to discussion of Level Control in the Fixed Format section.

INTERFACES

As mentioned earlier, there are three interfaces available with the 6010A: IEEE-488, RS-232C, and a Fluke-defined parallel ASCII interface. All interfaces use the same programming formats discussed earlier.

Choice of Interface

In order to help the user in selection of an interface, we have listed controllers appropriate to each interface.

Standard Interface:

Paper tape reader with parallel output
ASCII keyboard with parallel output
Microprocessor Software Development machines such as:
- Intellec 4 or 4/40 by Intel
- Intellec 8 or 8/80 by Intel
- Motorola Exorcisor for 6800 series

Peripheral Controller cards from minicomputers, such as:
- DR11C card for DEC PDP-11
- HP12556 microcircuit interface for HP computers
- 4041/4040 16 bit I/O for Data General Nova/ Super Nova series machines

IEEE-488 Interface (Option -05):

Tektronix 4051 Graphic System
HP 9800 Series calculators
Keithley System One with 7802-ISB card
Compucorp Model 425-IS calculator

RS-232C Bit-Serial Interface (Option –06):

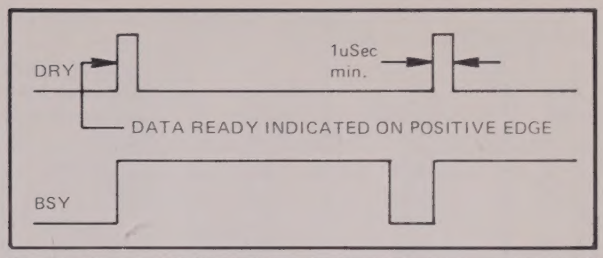
Teletype machines (Model 33, 35, 37)
CRT Terminals
Data Modems
Virtually any minicomputer with appropriate interface card.

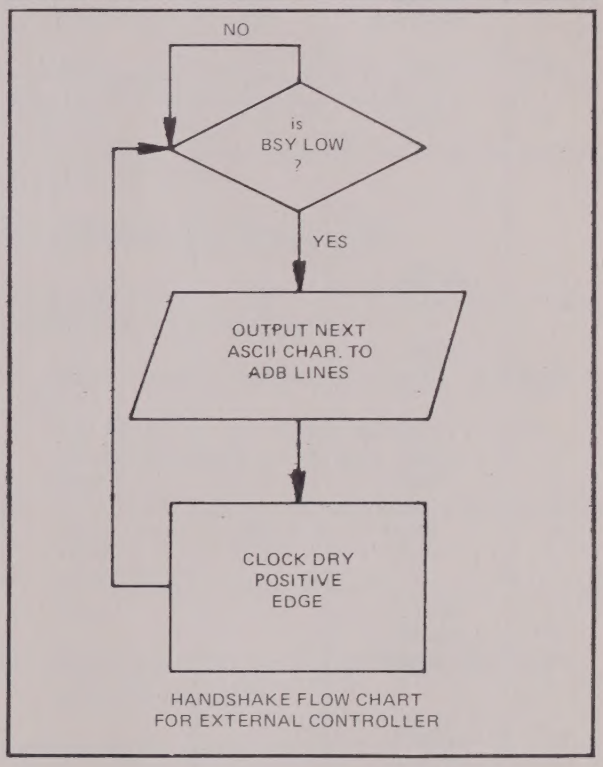
Standard Interface (Fluke - defined)

Refer to pin connections of the remote connector in Table 3. This interface uses 7 parallel ASCII defined data lines controlled by two handshake lines. ASCII data bit 8 (or parity bit) is ignored. ADB1 is least significant bit, ADB7 is most significant.

Logic family is TTL. A true condition (or 1) is indicated by a voltage level from +2.4VDC to +5VDC. A not-true condition (or 0) is indicated by a voltage from 0 to +0.8VDC. Gate load represented by each input and sink capabilities of outputs are listed in Table 3. All inputs have 10 kΩ pullup resistors. 1GL = 1.6 mA.

When the data at remote connector is to be read, the controller raises the DRY (Data Ready) line high for a period of at least one microsecond. When DRY goes high, the BSY (Busy) line will go high and remain high for as long as the data is required to be held on the data lines. Refer to the following timing diagram.





HANDSHAKE FLOW CHART FOR EXTERNAL CONTROLLER

Internal Processing Time

Refer to Tables 1 & 2. Typical processing times for each character are listed. The busy flag will go away prior to processing being completed. If new data is presented while the previous character is being processed, the BSY line will go high and remain high during this processing time, as well as during the interval when the new data is read.

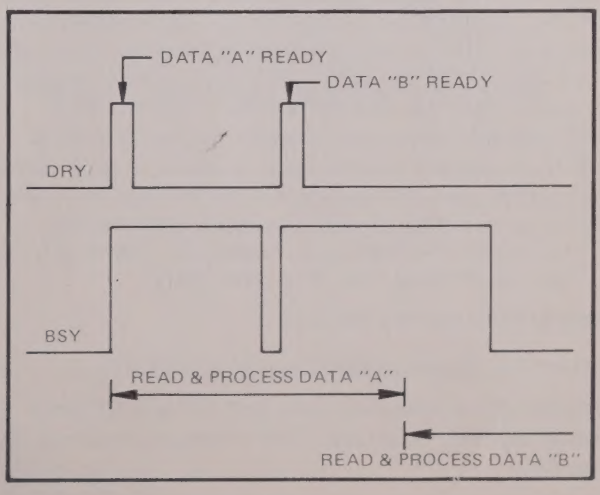


Table 3. REMOTE CONTROL CONNECTIONS FOR STANDARD INTERFACE

Pin No.	Function	Input or Output	#of Std. TTL Gate loads that function will present or sink	Description
1	ADB1	In	1.31GL	Four of eight ASCII Data Bit input lines
2	ADB2	In	"	
3	ADB3	In	"	
4	ADB4	In	"	
5	POWER ON	Out	1.0 GL	+5 volt indicates 6010A power is on. Low indicates power off.
6	DRY	In	0.42GL	Data Ready: positive edge indicates that the input data is ready for transfer. Must stay high for at least 1uSec.
7	BSY	Out	2.8 GL	Busy indication: high true indication that the 6010A is busy reading the input data. NOTE The input data to the 6010A must be held constant until the BSY line goes low.
8	SPARE			
9	REM	In	1.43GL	Remote control order: low true input to order 6010A remote operation.
10	SPARE			Do not use
11	ROL	Out	10 GL	Reduce output level: high true indication on that the 6010A is being amplitude modulated to produce an output beyond the range of the internal circuitry.
12	SPARE			
13	ADB5	In	1.31GL	Four of eight ASCII Data Bit input lines.
14	ADB6	In	"	
15	ADB7	In	"	
16	ADB8	In	0.31GL	ASCII Data Bit 8 is ignored. It is tied thru a 10 KΩ resistor to +5VDC.
17	SPARE			
18	SPARE			
19	RC FORMAT	In	1.31GL	Remote Control Format: fixed form remote control is called when pin 19 is open or high. Free form remote control is called when pin 19 is pulled low. Do not change while unit under remote control.
20	SPARE			
21	SPARE			
22	SPARE			
23	SPARE			
24	GND			Ground: provides a connection to 6010A logic common.

Remote Connector Information: the remote connector on the rear of the 6010A is an Amphenol 24 pin Micro Blue Ribbon with wire hold-down bales. The mating connector is an Amphenol 57-30240 (Fluke part number 272427).

IEEE Std 488-1975 Interface (Option –05)

This interface is option 05 and allows compatibility with the IEEE Standard Digital Interface for Programmable Instrumentation. This standard was formerly known by such names as IEC Bus, HP-IB, and GPIB. ASCII Bus is a name frequently misapplied to the IEEE-488 interface standard. While IEEE-488 does define some interface messages in terms of ASCII, the standard does not speak to coding of data. Rather than go into a detailed discussion of the Standard, the reader is referred to the actual publication itself, published by:

The Institute of Electrical and Electronic Engineers, Inc.
345 East 47 Street, New York, NY 10017

Message Paths and Bus Structure

(Reference: paragraph 1.4.3, page 11 of IEEE-488)

The 6010A is a listen only device with E01 and SRQ lines neither used nor recognized. DI08 is not recognized as a data bit.

Interface Function Repertoire

(Reference: paragraph 2.1.2.3, page 13)

The 6010A has the following Interface Functions:

Acceptor Handshake	AH1
Listener	L2
Remote Local	RL2

All other functions are zero.

Listen Addresses

(Reference: paragraph 6.3.2, page 60)

MLA (my listen address) bits L1 through L5 are set on the interface card (6010A-4008). This PCB is located behind the front panel. Access is gained by removal of the top cover. Table 4 lists listen addresses.

ALLOWABLE LISTEN ADDRESSES							
Binary No.	L5	L4	L3	L2	L1	ASCII	Character
0	0	0	0	0	0	SP	Space
1	0	0	0	0	1	!	exclamation mark
2	0	0	0	1	0	"	quotation mark
3	0	0	0	1	1	#	pound sign
4	0	0	1	0	0	$	dollar sign
5	0	0	1	0	1	%	per cent
6	0	0	1	1	0	&	and
7	0	0	1	1	1	'	apostrophe
8	0	1	0	0	0	(	left parenthesis
9	0	1	0	0	1	)	right parenthesis
10	0	1	0	1	0	*	asterisk
11	0	1	0	1	1	+	plus
12	0	1	1	0	0	,	comma
13	0	1	1	0	1	-	minus
14	0	1	1	1	0	.	decimal point
15	0	1	1	1	1	/	slant bar
16	1	0	0	0	0	Ø	zero
17	1	0	0	0	1	1	
18	1	0	0	1	0	2	
*19	1	0	0	1	1	3	
20	1	0	1	0	0	4	
21	1	0	1	0	1	5	
22	1	0	1	1	0	6	
23	1	0	1	1	1	7	
24	1	1	0	0	0	8	
25	1	1	0	0	1	9	
26	1	1	0	1	0	:	colon
27	1	1	0	1	1	;	semicolon
28	1	1	1	0	0	<	less than
29	1	1	1	0	1	=	equals
30	1	1	1	1	0	>	greater than

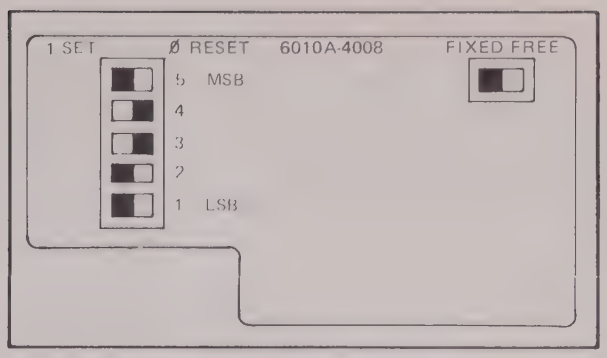
* Factory setting

Explanation of IEEE 488 Address Switch Operation

When a switch is in the lefthand position, that bit is set.

This example has address switch set for 19; i.e.,

L number				
5	4	3	2	1
1	0	0	1	1



Selection of Fixed/Free Programming Format

This selection is also accomplished by a switch on the interface card. See above.

RS-232C Interface (Option –06)

This is a bit-serial binary data interface defined by EIA Standard RS-232C. Features include:

1) Asynchronous data rates from 110 baud to 9600 baud.

2) 20 mA non-isolated Teletype interface as well as Standard voltage level interface.

3) 32 character first in, first out buffer memory to allow bursts of data at high rates.

4) Unit will return a status character when ready for more data.

5) Compatible with interface subsets A, B, C, D, and E (RS-232C, section 5).

Voltage or Current Interface

A selection must be made as to which type of interface will be used: Standard RS-232C voltage levels, or 20 mA current loop such as is used by Teletype machines. These interfaces are brought out on separate pins. See Table 5, (pin assignments). In addition, switch S1 on interface card 6010A-4010 located behind the front panel PCB must be set to the appropriate position. To gain access to this board, remove the top cover of the instrument. The voltage interface, circuits BB and BA, are terminated and originated by type 8T16 and 8T15 integrated circuits, respectively. These I.C.s are manufactured by signetics.

Table 5.

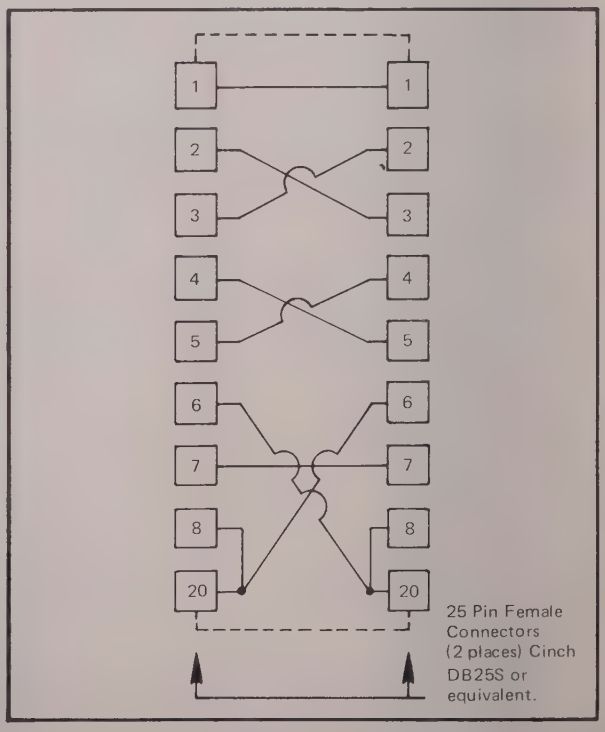
6010A Synthesized Signal Generator	6010A-4456 Adapter Cable Assembly Pin Assignments		RS-232C Description		
Function (Remote Connector J4 on rear panel)	"24 pin" Conn. J1	"25 pin" Conn. J2	Data Flow	Circuit	Description
SDI (Serial Data In)	6	3	←	BB	Rec'd Data
Signal Ground	5	7		AB	Signal Gnd
SDO (Serial Data Out)	7	2	→	BA	Transmitted Data
Send Source +	20	11	→		20 mA Transmitted Data
Send Return –	23	12	→		
Receive Source +	12	13	←		20 mA Received Data
Received Return –	18	14	←		
Chassis Ground	24	1		AA	Protective Gnd
Remote Control Format	19 (wired together)	N/C			
Signal Ground	11 (wired together)	N/C			
REM (Remote Control Order)	9 (wired together)	N/C			
	N/C	Wired Together 8	←	CF	Rec'd Line Sig. Det.
		Wired Together 20	→	CD	Data Term. Ready
	N/C	Wired Together 4	→	CA	Request to Send
		Wired Together 5	←	CB	Clear to Send
	N/C	6	←	CC	Data Set Ready
Grounded on Interface Card	17, 21, 22	N/C			
N/C	All other pins	N/C			
	N/C	All other pins			N/C

Null Modem

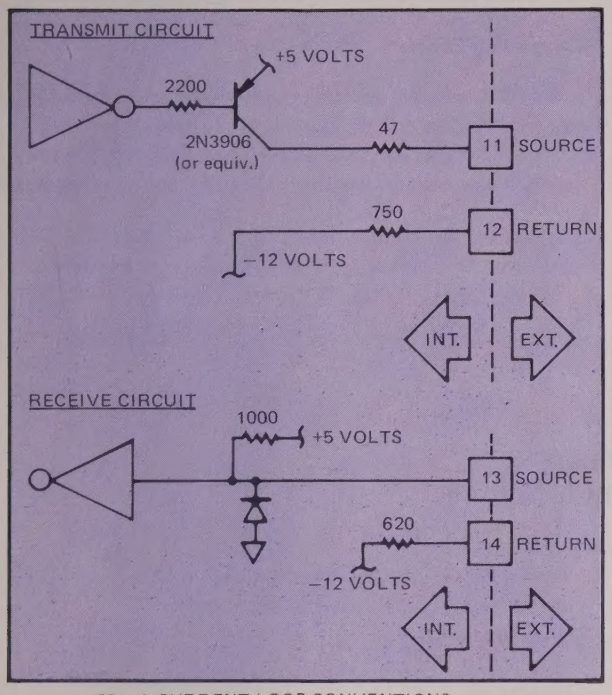
Because RS-232C defines a data communications device such as a modem as the only place a female connector can be used, and because data terminal devices such as CRT terminals can be used to program the generator, it may be desirable to implement a null modem to avoid rewiring standard connectors.

A null modem accessory device provides a means of connecting two EIA RS-232 compatible devices together without the implementation of a non-standard cable, or modification of connections internally to either device.

The null modem consists of two female RS232 connectors wired back to back as follows:



The 20 mA current loop interface circuits are shown below:

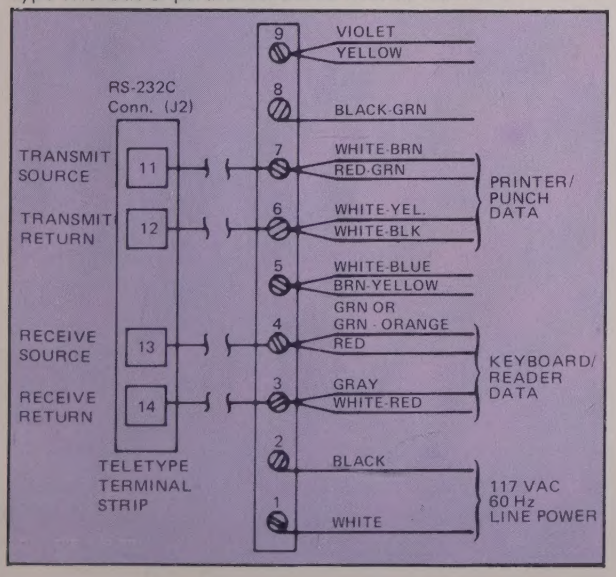


20 mA CURRENT LOOP CONVENTIONS

	LINE CURRENT	
	1 = 0mA	1 = 20 mA
BINARY STATE	1	Ø
SIGNAL CONDITION	Marking	Spacing

These circuits are referenced to chassis ground, (non-isolated), and require isolated (non-grounded) terminations in the data communication equipment or Teletype machine. Note that the 20 mA current sources are provided with this interface, and are inseparable from it. Be certain that sending and receiving circuits to which this interface is connected do not have any other 20 mA current sources. Disconnect any external current sources.

Recommended Method of Connection to Model ASR33 Teletype Without Separate Hardware Reader Control.



Data Transfer Rates

Baud rates of 110, 150, 300, 600, 1200, 2400, 4800, and 9600 are selectable by wiring a jumper in socket X1 on the interface card (6010A-4010). This card is made accessible by removal of the top cover of the instrument. It is located behind the front panel.

Data Format

When this interface is shipped from the factory, data format is as follows:

No. of data bits - 8 including one allocated for parity
No. of Start bits - 1
No. of Stop bits - 2
Parity bit - ignored

By cutting jumpers on the interface card, (6010A-4010), one may alter the format required for received characters and transmitted characters.

These land patterns are adjacent to the UART I.C., U1, pins 35 through 39. These pins come factory wired to +5VDC.

1 = +5VDC 0 = GND

		NO. OF DATA BITS			
U1 PIN NO.	FUNCTION	8	7	6	5
38	NB1	1	0	1	0
37	NB2	1	1	0	0

		TYPE OF PARITY			
U1 PIN NO.	FUNCTION	NONE		EVEN	ODD
39	EPS	1	0	1	0
35	NP	1	1	0	0

U1 PIN NO.	FUNCTION	2 STOP BITS	1 STOP BIT
36	TSB	1	0

Buffer Memory

Data received by this interface is buffered by a 32 character first in, first out memory. This allows a string of characters to be sent to the generator at high data rates without fear of losing a character due to generator processing time.

Provision has been made for status interrogation of the 6010A RS-232C interface, primarily to signal the controlling device that the memory is empty and ready for another string. This is done by sending a ? (question mark) as the last character of a string.

When the question mark is clocked out of memory and decoded, a Ø cr (zero and carriage return) is sent back to the controller, indicating that the generator is ready for more data. Before more data will be recognized, however, a cr (carriage return) must be returned by the controller to the generator. Controllers with an echo-back mode on their I/O ports satisfy this requirement. If the controller does

not echo back characters sent to it, begin each new string with a cr if you ended the previous string with a question mark.

Remote/Local Control

When the RS-232C adapter cable (6010A-4456) is plugged into the remote control connector on the rear panel of the 6010A, the generator is called into remote control. This is accomplished by a jumper wire on connector J1 of the adapter cable between pins 11 and 9. See Table 4. This jumper may be cut, and pin 9 wired to a TTL gate or switch to select remote or local. Pin 9 will rise to +5 VDC when open, and 2.3 mA will flow out of pin 9 when shorted to ground.

Programming Format

The RS-232C adapter cable (6010A-4456) comes factory-wired for Free Format programming. If the jumper wire (in J1 of the cable) between pins 11 and 19 is cut, the generator will recognize Fixed Format programming instructions.

Alternatively, pin 19 may be wired to a switch or TTL gate to select format. When open, pin 19 will be at a potential of +5V dc. When shorted, 2.1 mA will flow out of it. Do not change formats while unit is under remote control.

6010A/6011A
RACK MOUNTING KITS/SLIDES

These half rack width signal generators may be mounted in left offset, right offset, center mount, or dual configurations with or without slides.

M05-203-601
Left or right offset rack mounting kit. Use of slides not possible; generator should be supported at side or rear.

M05-203-602
Centered rack mounting kit for one instrument. Use of slides not possible; generator should be supported at rear.

M05-200-603
Dual side-by-side rack mounting kit. Instruments must be supported at sides, rear or with slides.

M00-260-610
18" chassis slides for use with dual side-by-side rack mounting kit.

M00-203-631
Left or right offset rack mounting kit including 18" chassis slides. Mounts one generator.

NOTES

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